Remarks

Claims 1, 5-6, 8, 12-14, 20, and 46-47 are here amended, claims 2-3, 9-11, 28-45 are canceled, and new claims 48-49 are added. Upon entry of this amendment, claims 1, 4-8, 12-27, and 46-49 are pending.

Support for amendment of claim 1 is found on p. 20 lines 1-2 of the specification as filed, and in the claims as originally filed. Support for amendment of claim 5 is found on p. 12, lines 18-22. Support for amendment of claim 6 is found on p. 7, lines 27-28 and p. 13, lines 7-8. Support for amendment of claim 8 is found on p. 20, lines 1-2. Support for amendment of claim 12 is found on p. 8, lines 15-16 and p. 20, lines 1-2. Support for amendment of claim 13 is found on p. 8, lines 28-30. Support for amendment of claim 14 is found in this claim as originally filed and on p. 13, line 12. Support for amendment of claim 20 is found on p. 20, lines 27-28. Support for amendment of claim 46 is found on p. 20, lines 1-2 and on p. 23, lines 2-19. New claim 48 is supported on p. 14, lines 12-13. New claim 49 is supported by claim 46, lines 2-3, as originally filed. No new matter is added by this amendment.

Claims 28-45 are canceled in view of the Restriction Requirement. Applicants reserve the right to pursue the subject matter of canceled claims or other claims of the same scope in this or in another application having the filing date or same priority date as the present application.

Claim 14 meets requirements of 35 U.S.C. §112 ¶2

The Office Action rejects claim 14 under 35 U.S.C. §112, second paragraph, as indefinite for lack of antecedent basis for reciting the term "control fluid." Applicants respectfully point out that the term the term "control fluid" appears in claim 12 from which claim 14 depends, *i.e.*, at line 5 of the claim: "each of the control lines including an inlet for receiving a control fluid."

Notwithstanding the claim having proper antecedent basis, Applicants here amend claim 14 to clarify that the control fluid in this embodiment of the invention is a gas.

Applicants respectfully request that rejection of claim 14 under 35 U.S.C. §112 ¶2 be withdrawn.

Prior to discussing the art cited in the Office Action, Applicants believe that it would be useful to the Examiners to summarize the present claims as amended herein.

Invention of the present claims

The present invention in various embodiments provides a microfluidics device or apparatus that for the first time allows using microcantilevers for analyzing a plurality of liquid samples in a plurality of interaction cells, within a convenient housing. Each of the plurality of interaction cells has a plurality of microcantilevers, and the plurality of microcantilevers within an interaction cell are configured to deflect in response to an interaction involving a component of sample fluid, i.e., the microcantilever is a biosensor. In its present commercial embodiment, the microfluidics device is a cartridge that is inserted into a manifold for fluid supply, thermal control, laser reading, and integrated circuitry. Because the device includes a plurality of interaction cells, different samples can be analyzed in the same cartridge at the same time.

A microcantilever platform within the microfluidics device is designed to receive a plurality of microcantilevers in each cell, so that the user can configure the microcantilevers to deflect in response to a chosen component of sample fluid. In a particular embodiment, the microcantilever platform has a plurality of microcantilevers in each cell. Because the microcantilevers in an interaction cell are identically configured, statistical signficance is obtained by analyzing simultaneous deflections of the pluralities microcantilever deflections in the cell or cells. In another embodiment, the microcantilever platform is configured to include microcantilevers, and does not yet have the microcantilevers inserted. The platform is a commercial product that is in and of itself useful, as the user can supply pre-treated microcantilevers (a plurality of which is sometimes referred to as a "hand" of microcantilever "fingers"). The user can obtain the device and following the working examples, can configure the microcantilevers to be responsive to a chemical interaction in a sample. The platform and the microfluidics device are designed for use with a reading apparatus including a thermal control base and a laser generator (light source) and reader (detector), however the microfluidics/microcantilever component *per se* is non-obvious as is discussed below.

Claims 1-10 are non-obvious

Claims 1-10 are rejected on p. 2, ¶ 1 of the Office Action under 35 U.S.C. §103(a) in view of the combination of Furcht et al. U.S. patent number 6,054,277 and Wolk et al. U.S.

patent number 6,620,625. Claims 2-3 and 9-10 are here canceled, therefore rejection of these claims is moot.

Applicants characterize each of Furcht and Wolk, and show that pending claims 1 and 4-8 are not obvious in view of these references alone or in combination.

Furcht et al. U.S. patent number 6,054,277

Furcht et al. describes a lab-on-a-chip for DNA amplification and testing. This patent shows a genetic "strip reader" analysis device which is inserted into a laptop computer, the device reading a genetic test card used to analyze a single sample. A single sample of interest is placed in the device, and is transferred to an amplification chamber, then to a detection sensing chamber containing a detection apparatus.

Furcht's strip reader is a single chamber device which may only accept a single sample (the reaction begins when the card is saturated with the contents of a "cocktail pouch"; Furcht et al., col. 8 lines 31-50). With the Furcht device, testing a plurality of samples can be done only by introducing each, one at a time, into a plurality of different genetic cards, which are then read by the computer one at a time.

More importantly, Furst's three microcantilevers within the single chamber of the genetic card shown in Furcht in Fig. 1 (component **13**) are each configured to be different from the others, and are referred to as "...a system with an internal reference sensor **24**, a relevant negative control sensor **25**, and a third sensor **26** dedicated to the detection of a specific and prescribed analyte" (See Furcht et al., col. 11, lines 6-8).

Furcht fails to show a device having a plurality of interaction cells for analyzing a plurality of different sample fluids, such that each cell has a plurality of microcantilevers, and the plurality of microcantilevers in the cell is configured to deflect in response to an interaction involving a component of the sample fluid, thereby analyzing the plurality of samples.

Further, Furcht's cantilevers require an applied voltage (Id., col. 11 line 67 to col. 12 line 9), while the cantilevers in the present claims are free of electrical attachments. Furcht's cantilevers are constructed for piezoelectric readout, and therefore are very complex multilayered structures: silicon nitride on a silicon substrate beam overlaid with a bottom electrode of titanium

and platinum, a thin film of PZT 88 and a top electrode of titanium and platinum. The upper surface of Furcht's top electrode is electroplated with elemental gold.

Even if it were obvious to extend Furcht by using a plurality of the single-chambered test strips described in this reference, it would not have been obvious to one of ordinary skill in the art, reading Furcht at the time the present application was filed, to use microcantilevers without an applied voltage, i.e., to use deflection of the cantilever per se as the sensing mechanism, rather than piezoelectric sensing requiring an applied voltage, is taught by Furcht. In addition, it would not have been obvious to one of ordinary skill, reading Furcht, to omit the amplification chamber.

Most important, it would not have been obvious to configure Furcht's three cantilevers, in each of a plurality of test cells, to be the same, because Furcht et al. clearly describes three different functions for the three different cantilevers, and therefore teaches away from the claims as here amended.

For any of these reasons, the invention of claims 1 and 4-8 would not have been obvious to one of ordinary skill in microfluidics art from Furcht et al.

Wolk et al. U.S. patent number 6,620,625

Wolk et al. describes methods for solubilizing and then sampling a large number of different materials arrayed on surfaces of planar library storage components (Wolk et al., Abstract, lines 1-2). Wolk's apparatus works with multi-well test plates, having fluidic distribution devices. A microcapillary element is the fluidic distribution device, and provides solubilizing fluid, however this appears to be an improved micropipet that is detachable and not integral to the surface array device, i.e., is not within a housing of a microfluidics device. Wolk describes high throughput sample processing and analysis capable of processing samples arrayed over a planar surface. Sample and fluid transfer are accomplished by xyz robotic manipulation over the surface of the sample array, the robotic component being external to the fluidics portion. No microcantilevers are referred to, or taught or suggested.

Wolk does not cure any of the deficiencies of Furcht et al. Wolk fails to show, teach or suggest even a single microcantilever, let alone a plurality of microcantilevers in each of a plurality of interaction cells, the plurality in the interaction cell configured to deflect in response

to an interaction with a component of a sample fluid. Wolk does not suggest omission of applied voltage from the three differently configured microcantilevers of Furcht's device, nor omission of Furcht's amplifying chamber.

Since neither Furcht nor Wolk cure the deficiencies of the other, neither of these references, alone nor the combination, teaches or suggests the subject matter of claims 1 and 4-8.

Applicants respectfully request that rejection of claims 1 and 4-8 as here amended, in view of Furcht et al. and Wolk et al., alone or in combination, be withdrawn.

Claims 12-27 and 46-47 are non-obvious

Claim 11 is rejected on p. 6, ¶ 2 of the Office Action under 35 U.S.C. §103(a) as unpatentable over Furcht in view of Wolk, and further in view of Pfost et al. U.S. patent number 6,485,690. Since claim 11 is here canceled, this rejection is moot.

Claims 12-27 and 46-47 are rejected on p. 8, ¶3 of the Office Action under 35 U.S.C. §103(a) in view of Furcht et al. U.S. patent number 6,054,277 and Wolk et al. U.S. patent number 6,620,625 and further in view of Pfost et al., patent number 6,485,690.

Pfost et al., U.S. patent number 6,485,690

Pfost et al. describes a fluid sample processor (Pfost col. 1, line 18) for performing combinatorial chemistry reactions, the processor having an upper distribution layer with feed-through channels, and apertures to fill reservoirs. The center distribution layer has reservoirs, channels, reservoir feeds, cell feeds and overflow feeds, and back-flow valves (Id., col. 2, lines 49-57). Pfost's device has separable "plate" members, viz., a distribution plate, a well plate and a reservoir plate (Id., col. 24, lines 7-12). The well plate member can be released from the distribution plate (col. 24, lines 46-47). The size and functionality are suitable for an 8 x 12 multi-well microtiter plate format, i.e., 96-member microtiter plate. Reaction vessels are described as having very small liquid capacities of 5-2000 nanoliters (Id., col 15, lines 19-21), or more preferably 100-800 nanoliters in volume, i.e., hold only a volume of at most 2 microliters, preferably 0.1-0.8 microliters, hence Pfost is actually a nanofluidics device. No single microcantilever is shown, nor are a plurality of microcantilevers in each cell even referred to, taught or suggested.

Pfost fails to cure the deficiencies of Furcht and Wolk. Pfost fails to show, teach or suggest any microcantilevers, let alone a plurality of microcantilevers in each of a plurality of interaction cells as in claims 12-27 and 46-47 as here amended. One of ordinary skill in the art reading Pfost at the time the present invention was made, would not be guided by Pfost's separable plate members, distribution plate, well plate, etc. to invent the devices and platforms of the claims as here amended, having a plurality of interaction cells each having a plurality of microcantilevers, and all within a housing. In addition, Pfost fails to teach or suggest to one of ordinary skill to not to use the piezoelectric voltage readout nor the amplifying chamber of Furcht's genetic strip reader, and fails to teach or suggest not use the solubilizing and distributing function of Wolk, and most important, not to use Furcht's three cantilevers each differently configured.

In addition, each of the Wolk and Pfost patents, issued more recently than Furcht, fails to reference or to cite Furcht et al. The most recent patent, Wolk et al., fails to reference either Furcht or Pfost. There is no motivation for one of ordinary skill, reading Wolk or Pfost, even to make the combination with Furcht, even if it were obvious from these references to produce the devices and apparatus of the claims as here amended.

Since claims 12-27 and 46-47 as here amended are not taught or suggested by the references cited by the Examiners, alone or in combination, Applicants respectfully request that the rejection be withdrawn.

Conclusion

On the basis of the foregoing amendments, Applicants submit that the pending claims are in condition for allowance, which is respectfully requested. If there are any questions regarding these amendments and remarks, the Examiners are invited and encouraged to contact the undersigned at the telephone number provided below.

Respectfully submitted,

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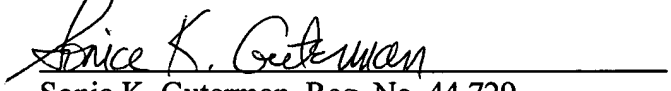

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